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**Earth Science Information:  
Planning for the Integration and Use of Global  
Change Information**

**FINAL TECHNICAL REPORT 1991**  
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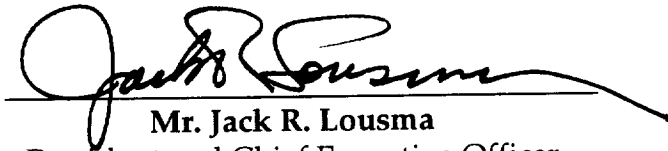
**Submitted by:**

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## APPROVAL

A handwritten signature in black ink, appearing to read "Jack R. Lousma", is written over a horizontal line.

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## The Consortium for International Earth Science Information Network

### FINAL TECHNICAL REPORT 1991

The Consortium for International Earth Science Information Network (CIESIN) was founded in 1989 as a non-profit corporation dedicated to facilitating access to, use and understanding of global change information worldwide. The Consortium was created to cooperate and coordinate with organizations and researchers throughout the global change community to further access the most advanced technology, the latest scientific research, and the best information available for critical environmental decision making.

CIESIN study efforts are guided by Congressional mandates to *"convene key present and potential users to assess the need for investment in integration of earth science information,"* to *"outline the desirable pattern of interaction with the scientific and policy community,"* and to *"develop recommendations and draft plans to achieve the appropriate level of effort in the use of earth science data for research and public policy purposes."* In addition, CIESIN is tasked by NASA to develop a data center that would extend the benefits of Earth Observing System (EOS) to the users of global change information related to human dimensions issues.

For FY 1991, CIESIN focused on two main objectives. The first addressed the identification of information needs of global change research and non-research user groups worldwide. The second focused on an evaluation of the most efficient mechanisms for making this information available in usable forms.

#### Identification of Information Needs

To identify and assess user needs, CIESIN conducted user assessment workshops, sponsored research studies and science pilot projects, developed a conceptual model for understanding human dimensions of global change, and began interactions with federal agencies who are major holders of global change information, including the U.S. Environmental Protection Agency and the U.S. Department of Agriculture. The following activities were conducted.

**User assessment workshops and conferences** were held to address issues including: (1) the adequacy and accessibility of existing data facilities and access problems, including fragmented data collections and variable or nonstandard formats, (2) the need for collecting data that can be readily transformed into a geo-referenced format, and (3) the need to exploit the potential of remote sensing for generating useful data. CIESIN co-hosted the Pacific Rim Conference and held workshops with the Ministry of the Environment for the Republic of Czechoslovakia and with the Latin American Society of Remote Sensing Specialists (SELPER). A workshop for international experts in the field of health and environmental science was used to obtain advice from the user community concerning databases and information systems. This led to agreements with Centers for Disease Control (CDC) and the Agency for Toxic Substance and Disease Registry (ATSDR) to establish remote database access and test interoperability.

CIESIN conducted nine **science pilot projects** to identify the data and information needs related to global change issues. By focusing on interdisciplinary global change research, these projects could demonstrate actual integration of natural and human science information. Project goals were chosen to demonstrate the feasibility of managing, evaluating, and transferring knowledge about global change generated by interdisciplinary science to a variety of users to support decision making and policy formulation. Final reports were prepared in late 1991. From these, CIESIN is producing a report summarizing the findings of all the projects. Additional **sponsored studies** were conducted by the International Social Science Council (ISSC) on attitudes survey research, demographics, and economics in order to: (1) identify resource information, (2) assess the scientists' information gathering process, and (3) assess the feasibility of collating human science databases for electronic access.

CIESIN began a study addressing the human activities within social systems, including population dynamics, economic systems, political systems, and technology development and implementation, which have an impact on the global environment. A conceptual model — a **Social Process Diagram** — was developed showing how human activities and interactions affect and are affected by global change. The Social Process Diagram can help scientists evaluate what people want, what they know, what they expect, and how they organize, and how they produce and consume resources.

CIESIN forwarded a **summary of its first report to Congress** containing a series of findings and recommendations. It was reported that there are significant gaps and inadequacies in existing global change data bases and analytical models in the natural and social sciences, particularly in developing countries. It is imperative to improved understanding of global change to know where these data bases and models are and how to access them.

## **Design of Information Exchange Methodologies**

CIESIN began the design of information exchange and sharing methodologies, including the development of interactive models, electronic user interface with the NASA Global Change Master Directory, and knowledge sharing capabilities to support scientists, educators, and policy makers. Activities in each of these areas included the following:

A concept demonstration of CIESIN's **electronic Global Environmental Directory Service** software was completed. Using the X Windows/Motif-based interface of this Distributed Metadata Directory System, users will access data from directories that are located at different sites on the Internet. The demonstration also showed context switching mechanisms and interoperable compatibility with the Global Change Master Directory.

In addition, CIESIN became an increasingly active participant in **EOS development activities**, playing a role in several panels and working groups. These include the EOSDIS Data Panel, the IMS Working Group, the EOSDIS v.0 System Engineering Working Group, the EOS Users Service Working Group, and the IWGDMGC Global Change Master Directory and Data Library subgroups.

A CIESIN **DIS (Data and Information System) Design Development Plan** and a **Data Plan** were developed to meet three primary objectives: (1) To carry out a functional analysis of

system requirements; (2) To establish a baseline data and information resources development plan; and (3) To identify a baseline information technology system configuration. The DIS Development Plan establishes all system functions and identifies the proposed architecture for communications and computing systems. The Data Plan will establish a development road map for CIESIN data directory "pointings" and data and information "holdings." These plans were reviewed by an independent review team in early 1992 and then revised.

An **environmental-economic model** to study the impact of climate on human systems and of human behavior on physical systems in developed countries, is being developed by Professor Urs Luterbacher of the University of Geneva. The current structure is a general and theoretical one, setting the stage for empirical studies of specific geographical regions or key linkages at the global scale.

CIESIN undertook a number of **knowledge transfer pilot projects**. The initial focus of the knowledge transfer pilot projects was targeted at the education sector, with recognition that future activities will encompass the other sectors. The pilot projects included:

- *Aspen Ground Truth Studies: A Student Global Change Project.* Teachers were provided with remotely sensed images of their local area and a handbook containing primers on global change and ground truthing activities designed to engage students in ground truth field studies of local relevance and of value to the global change research community.
- *Global Student Village.* Through the establishment of an international network of schools collaborating on global change issues as a focus for environmental education, students and teachers can directly access weather data from satellites and portray the data on computers to track and analyze weather and predict events in the same manner as professional meteorologists.
- *Exploring Our Solar System: A Global Change and Space Science Multi-Media Learning Experience.* Development began on an interactive video disc program prototype which included multi-media presentation of video, still photographs, and computer generated, and remotely sensed images to enable students to analyze the earth's environment and gain a better understanding of global change issues.
- *Teacher Information Support Network.* Teachers were provided training to incorporate global change and environmental issues in their classrooms, use distance learning technology in the delivery of hands-on activities, and use global change and environmental data bases on fresh water resources and water pollution.

In summation, through its 1991 accomplishments, CIESIN has begun to build a gateway that will work within the global change community to collect, integrate, and disseminate data and information, and to forge a better understanding of the human dimensions of global change.